REMARKS

Claims 9-12, 21-30, and 32-77, and 79 are pending in the application. The Applicants note that due to a typographical error in the instant application, there was never a pending claim 31.

Claims 1-8 and 13-20 have been canceled without prejudice because they are drawn to non-elected inventions. The Applicants expressly reserve the right to prosecute the canceled claims in one or more divisional applications claiming the benefit of priority to the instant application and its predecessor(s). 35 USC § 121.

Claim 78, 80 and 81 have been canceled without prejudice because they are redundant in light of claims 38-40, 50-52, 62-64 and 75-77, which claims consist of the same limitations as those of the canceled claims.

Further, to expedite prosecution, claims 82-87 have been canceled because they claimed inherent properties of the claims upon which they depend.

Claims 9-12, 21-30, 32-34, 41-46, 53-58, 65-69, 71 and 79 have been amended. Support for the amendments can be found throughout the application, including the claims as originally filed. Therefore, no new matter has been added. Importantly, the claim amendments should not be construed to be an acquiescence to any of the claim rejections. Rather, the amendments to the claims are being made solely to expedite the prosecution of the above-identified application. The Applicants expressly reserve the right to further prosecute the same or similar claims in subsequent patent applications claiming the benefit of priority to the instant application. 35 USC § 120.

Election – Restriction

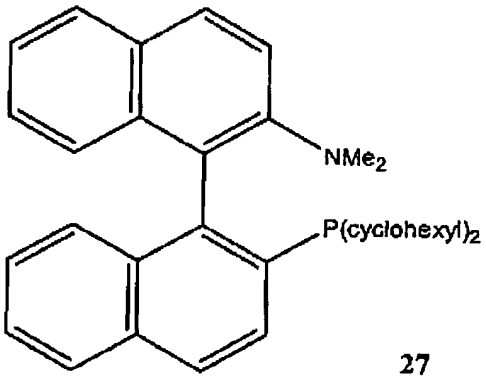
Election of Invention

The Applicants respectfully affirm the provisional election, made on August 27, 2002, of Invention III, claims 9-12, drawn to compounds represented by structure 3. However, the Applicants respectfully assert that simultaneous examination of Inventions III, V and VII would not place an undue burden on the Examiner because the Inventions

have in common a binaphthyl core. *See* MPEP § 803 ("If the search and examination of an entire application can be made without serious burden, the [E]xaminer must examine it on the merits, even though it includes claims to independent or distinct inventions."). Therefore, the Applicants respectfully request that the Examiner modify the instant Restriction Requirement, examining Inventions III, V and VII , i.e., claims 9-12, 15-16, and 19-20, in the instant application.

Election of Species

Likewise, the Applicants respectfully affirm the election of the species of Example 16, compund 27, which compund is depicted below. Of course, the elections of Species made herein is being made solely for search purposes. The Applicants expressly reserve the right to prosecute species not elected herein in other patent applications claiming the benefit of the filing date of this application. Furthermore, the Applicants understand that upon allowance of a generic claim, they will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim. *See* 37 CFR 1.141.



27

REJECTIONS BASED ON 35 USC 112¶2

Claims 9 and 10-12 stand rejected under 35 USC 112¶2, based on the Examiner's contention that they are indefinite for failing to particularly point out and distinctly claim the subject matter that the Applicants regard as the invention. Specifically, the Examiner has rejected the claims because various Markush groups therein include impermissible

open-ended language and the structure in claim 9 lacks labels subsequently referenced. Accordingly, the Applicants have amended all of the pending claims to render them definite in the context of 35 USC 112¶2, e.g., by replacing forbidden open-ended langauge with permitted closed-ended language. The Applicants earnestly hope that the Examiner will deem the instant response to be fully responsive to the pending non-final office action.

Accordingly, withdrawal of the rejections under 35 U.S.C. § 112¶2 is respectfully requested.

CLAIM REJECTIONS BASED ON THE JUDICIALLY-CREATED DOCTRINE OF OBVIOUSNESS-TYPE DOUBLE PATENTING

Various claims stand rejected under the judicially-created doctrine of obviousness-type double patenting, based on the Examiner's contention that the claims are not patentably distinct from various claims in United States Patent 6,307,087; and various claims of United States Patent 6,395,916. At this point, the Applicants respectfully request that the Examiner hold the obviousness-type double patenting rejection in abeyance until the second Office Action in the instant application. Should the Examiner maintain the rejection, the Applicants expect that in order to expedite prosecution to allowance of the pending claims, the Applicants will submit two Terminal Disclaimers, corresponding to the patents cited by the Examiner.

CONCLUSION

For the foregoing reasons, the Applicants respectfully request reconsideration and withdrawal of the pending rejections. Applicants believe that the pending claims are now in condition for allowance and early notification to this effect is earnestly solicited. If any questions are raised by this Response, the Examiner is urged to contact the undersigned at the telephone number listed below. A marked-up version of the amended claims appears below.

Respectfully submitted,
Patent Group
Foley Hoag LLP

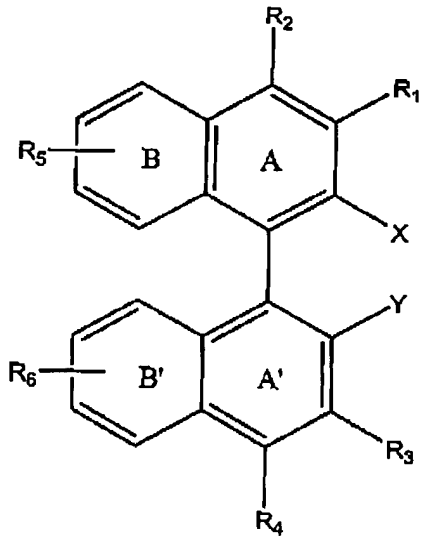
By: Dana Gordon
Dana M. Gordon, PhD
Reg. No. 44,719
Attorney for Applicants

155 Seaport Boulevard
Boston, MA 02210
Telephone: (617) 832-1000
Telecopier: (617) 832-7000

Date: 4/29/03

Marked-up Version of Amended Claims Showing Changes Made

9. **(amended)** The ligand represented by [general] structure **3**:



3

wherein

X and Y represent, independently for each occurrence, NR_2, PR_2, AsR_2, OR, or SR;

R, R_1, R_2, R_3, and R_4, for each occurrence, independently represent hydrogen, halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

R_5 and R_6, for each occurrence, independently represent halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl,

thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

the B and B' rings of the binaphthyl core independently may be unsubstituted or substituted with R_5 and R_6, respectively, any number of times up to the limitations imposed by stability and the rules of valence;

R_1 and R_2, and/or R_3 and R_4, taken together [may] optionally represent a ring consisting of a total of 5-7 atoms in the backbone of said ring; of which atoms [may comprise] zero, one or two atoms are heteroatoms [in its backbone]; and said ring is substituted or [may bear additional substituents or be] unsubstituted;

R_{80} represents an unsubstituted or substituted aryl, a cycloalkyl, a cycloalkenyl, a heterocycle, or a polycycle;

m is an integer in the range 0 to 8 inclusive; and

the ligand, when chiral, [may be provided in the form of] is a mixture of enantiomers or [as] a single enantiomer.

10. (**amended**) The ligand of claim 9, wherein:

X and Y are not identical;

R is selected, independently for each occurrence, from the [set] group consisting of alkyl, heteroalkyl, cycloalkyl, heterocycloalkyl, aryl, heteroaryl, aralkyl, heteroaralkyl, and $-(CH_2)_m-R_{80}$;

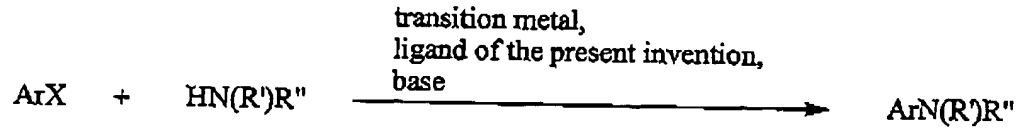
R_1, R_2, R_3, and R_4 are selected, independently for each occurrence, from the [set] group consisting of H, alkyl, heteroalkyl, cycloalkyl, heterocycloalkyl, aryl, heteroaryl, aralkyl, heteroaralkyl, halogen, $-SiR_3$, and $-(CH_2)_m-R_{80}$; and

R_5 and R_6 are selected, independently for each occurrence, from the [set] group consisting of alkyl, heteroalkyl, cycloalkyl, heterocycloalkyl, aryl, heteroaryl, aralkyl, heteroaralkyl, halogen, $-SiR_3$, and $-(CH_2)_m-R_{80}$.

11. **(amended)** The ligand of claim 9, wherein X is [hydrogen] NR_2; and Y is PR_2.

12. **(amended)** The ligand of claim 11, wherein R is independently for each occurrence alkyl or cycloalkyl.

21. **(amended)** The method depicted in Scheme 1:



Scheme 1

wherein

Ar is selected from the [set] group consisting of optionally substituted monocyclic and polycyclic aromatic and heteroaromatic moieties;

X is selected from the [set] group consisting of Cl, Br, I, $-OS(O)_2$alkyl, and $-OS(O)_2$aryl;

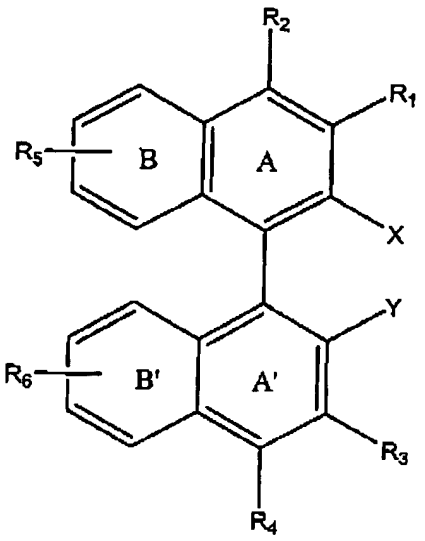
R' and R" are selected, independently for each occurrence, from the [set] group consisting of H, alkyl, heteroalkyl, aryl, heteroaryl, aralkyl, alkoxyl, amino, trialkylsilyl, and triarylsilyl;

R' and R", taken together, [may] optionally form an [optionally] unsubstituted or substituted ring consisting of 3-10 backbone atoms inclusive; of which atoms [said ring optionally comprising] zero, one or [more] two atoms are heteroatoms beyond the nitrogen to which R' and R" are bonded;

R' and/or R" may be covalently linked to Ar [such that the amination reaction is intramolecular];

the transition metal is selected from the [set] group consisting of the Group VIIIA metals;

the ligand is selected from the [set] group consisting of a compound represented by 3: [1-7 inclusive; and]



3

wherein

X and Y represent, independently for each occurrence, NR_2, PR_2, AsR_2, OR, or SR;

R, R_1, R_2, R_3, and R_4, for each occurrence, independently represent hydrogen, halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

R_5 and R_6, for each occurrence, independently represent halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

the B and B' rings of the binaphthyl core independently may be unsubstituted or substituted with R_5 and R_6, respectively, any number of times up to the limitations imposed by stability and the rules of valence;

R_1 and R_2, and/or R_3 and R_4, taken together optionally represent a ring consisting of a total of 5-7 atoms in the backbone of said ring; of which atoms zero, one or two atoms are heteroatoms; and said ring is substituted or unsubstituted;

R_{80} represents an unsubstituted or substituted aryl, a cycloalkyl, a cycloalkenyl, a heterocycle, or a polycycle;

m is an integer in the range 0 to 8 inclusive;

the ligand, when chiral, is a mixture of enantiomers or a single enantiomer; and

the base is selected from the [set] group consisting of hydrides, carbonates, phosphates, alkoxides, amides, carbanions, and silyl anions.

22. **(amended)** The method of claim 21, wherein:

[the ligand is **2**;]

the transition metal is palladium; and

the base is an alkoxide, amide, phosphate, or carbonate.

23. **(amended)** The method of claim 21 or 22, wherein:

[the ligand is **2**, wherein] X is [hydrogen] $N(alkyl)_2$, and Y represents $P(alkyl)_2$ or $P(cycloalkyl)_2$; and

X represents Cl or Br.

24. **(amended)** The method of claim 21, wherein:

[the ligand is **4**;] Y represents $P(alkyl)_2$ or $P(cycloalkyl)_2$; X represents $N(alkyl)_2$;

the transition metal is palladium; and

the base is an alkoxide, amide, phosphate, or carbonate.

25. **(amended)** The method of claim [22] 24, wherein:

[the ligand is 4, wherein R_1 and R_2 are absent; $P(R)_2$ represents PCy_2, and $N(R)_2$ represents NMe_2; and]

X represents Cl or Br.

26. **(amended)** The method of claim 21, wherein [:] HN(R')R" represents an optionally substituted heteroaromatic compound.

27. **(amended)** The method of claim 21, wherein: X represents Cl; [the ligand is 4, wherein R_1 and R_2 are absent, $P(R)_2$] Y represents P(t-Bu)$_2$ or PCy_2; [and $N(R)_2$] X represents NMe_2; the transition metal is palladium; and the base is an alkoxide, amide, phosphate, or carbonate.

28. **(amended)** The method of claim 21, wherein: X represents Br or I; [the ligand is 4, wherein R_1 and R_2 are absent, $P(R)_2$] Y represents P(t-Bu)$_2$ or PCy_2; [and $N(R)_2$] X represents NMe_2; the transition metal is palladium; the base is an alkoxide, amide, phosphate, or carbonate; and the transformation occurs at room temperature.

29. **(amended)** The method of claim 21, wherein: [the ligand is 5;] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8, independently for each occurrence represent hydrogen; the transition metal is palladium; and the base is an alkoxide, amide, phosphate, or carbonate.

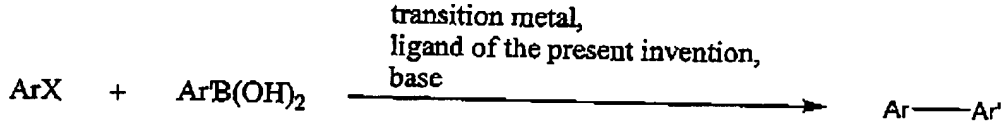
30. **(amended)** The method of claim 21, wherein: X represents Cl; [the ligand is 5;] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8, independently for each occurrence represent hydrogen; the transition metal is palladium; and the base is an alkoxide, amide, phosphate, or carbonate.

32. **(amended)** The method of claim 21, wherein: [the ligand is 2, wherein X and Y both represent P;] the transition metal is palladium; and the base is an alkoxide [, amide,] or phosphate [, or carbonate].

33. **(amended)** The method of claim 21, wherein: X represents Cl; [the ligand is 2, wherein X and Y both represent P,] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8 [are absent,] represent hydrogen; [and all occurrences of R are cyclohexyl;] Y represents P(t-Bu)$_2$ or PCy_2; X represents NMe_2; the transition metal is palladium; and the base is an alkoxide [, amide,] or phosphate [, or carbonate].

34. **(amended)** The method of claim 21, wherein [(alkenyl)X serves as a surrogate for ArX] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8 represent hydrogen; Y represents P(t-Bu)$_2$ or PCy_2; X represents NMe_2; the transition metal is palladium; and the base is sodium tert-butoxide or potassium phosphate.

41. **(amended)** The method depicted in Scheme 2:



Scheme 2

wherein

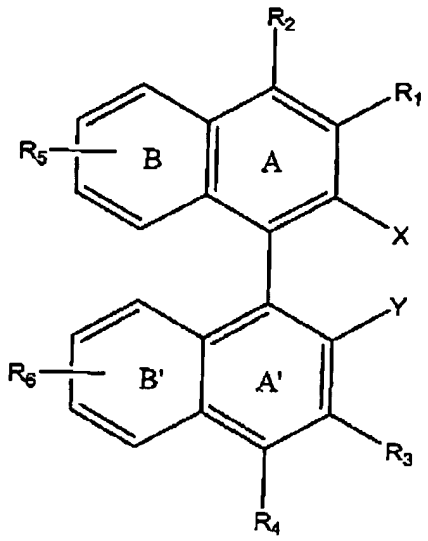
Ar and Ar' are independently selected from the [set] group consisting of optionally substituted monocyclic and polycyclic aromatic and heteroaromatic moieties;

X is selected from the [set] group consisting of Cl, Br, I, -OS(O)$_2$alkyl, and -OS(O)$_2$aryl;

Ar and Ar' may be covalently linked [such that the reaction is intramolecular];

the transition metal is selected from the [set] group consisting of the Group VIIIA metals;

the ligand is selected from the [set] group consisting of a compound represented by 3: [1-7 inclusive; and]



3

wherein

X and Y represent, independently for each occurrence, NR_2, PR_2, AsR_2, OR, or SR;

R, R_1, R_2, R_3, and R_4, for each occurrence, independently represent hydrogen, halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

R_5 and R_6, for each occurrence, independently represent halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

the B and B' rings of the binaphthyl core independently may be unsubstituted or substituted with R_5 and R_6, respectively, any number of times up to the limitations imposed by stability and the rules of valence;

R_1 and R_2, and/or R_3 and R_4, taken together optionally represent a ring consisting of a total of 5-7 atoms in the backbone of said ring; of which atoms zero, one or two atoms are heteroatoms; and said ring is substituted or unsubstituted;

R_{80} represents an unsubstituted or substituted aryl, a cycloalkyl, a cycloalkenyl, a heterocycle, or a polycycle;

m is an integer in the range 0 to 8 inclusive;

the ligand, when chiral, is a mixture of enantiomers or a single enantiomer; and

the base is selected from the [set] group consisting of carbonates, phosphates, fluorides, alkoxides, amides, carbanions, and silyl anions.

42. **(amended)** The method of claim 41, wherein

[the ligand is 2;]

the transition metal is palladium; and

the base is an alkoxide, amide, fluoride, phosphate, or carbonate.

43. **(amended)** The method of claim 41 or 42, wherein

[the ligand is 2, wherein] X is [hydrogen] NR_2, and Y represents $P(alkyl)_2$ or $P(cycloalkyl)_2$; and

X represents Cl or Br.

44. **(amended)** The method of claim 41, wherein:

the transition metal is palladium;

[the ligand is 4;] Y represents $P(alkyl)_2$ or $P(alkyl)_2$; X represents $N(alkyl)_2$; and

the base is an alkoxide, amide, carbonate, phosphate, or fluoride.

45. **(amended)** The method of claim [41] 44, wherein:

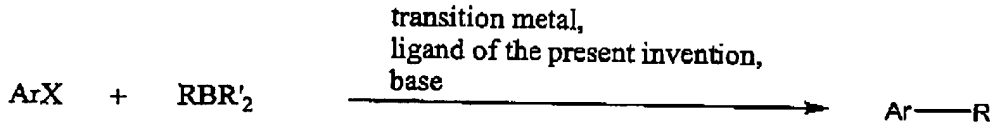
[the ligand is 4, wherein R_1 and R_2 are absent; $P(R)_2$ represents PCy_2, and $N(R)_2$ represents NMe_2;]

X represents Cl or Br; and

the reaction occurs at room temperature.

46. **(amended)** The method of claim 41, wherein [(alkenyl)X serves as a surrogate for ArX, and/or (alkenyl)$B(OH)_2$ serves as a surrogate for $ArB(OH)_2$] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8 represent hydrogen; Y represents $P(t\text{-}Bu)_3$ or PCy_2; X represents NMe_2; the transition metal is palladium; and the base is cesium fluoride or potassium fluoride.

53. **(amended)** The method depicted in Scheme 3:



Scheme 3

wherein

Ar is selected from the [set] group consisting of optionally substituted monocyclic and polycyclic aromatic and heteroaromatic moieties;

R is selected from the [set] group consisting of optionally substituted alkyl, heteroalkyl, and aralkyl;

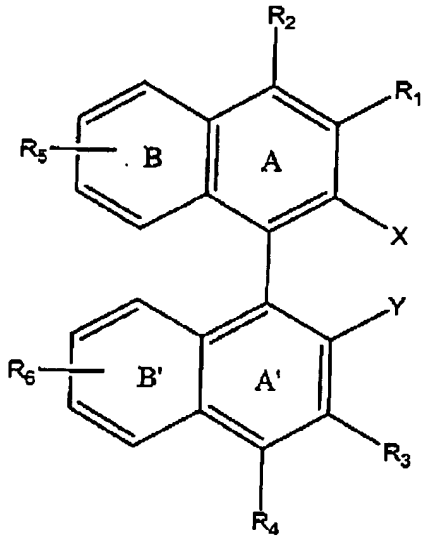
R' is selected, independently for each occurrence, from the [set] group consisting of alkyl and heteroalkyl; the carbon-boron bond of said alkyl and heteroalkyl groups being inert under the reaction conditions[, e.g., BR'_2 taken together represents 9-borobicyclo[3.3.1]nonyl.] ;

X is selected from the [set] group consisting of Cl, Br, I, $-OS(O)_2$alkyl, and $-OS(O)_2$aryl;

Ar and R may be covalently linked [such that the reaction is intramolecular];

the transition metal is selected from the [set] group consisting of the Group VIIIA metals;

the ligand is selected from the [set] group consisting of a compound represented by 3: [1-7 inclusive; and]



3

wherein

X and Y represent, independently for each occurrence, NR_2, PR_2, AsR_2, OR, or SR;

R, R_1, R_2, R_3, and R_4, for each occurrence, independently represent hydrogen, halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

R_5 and R_6, for each occurrence, independently represent halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine,

carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or -$(CH_2)_m$-R_{80};

the B and B' rings of the binaphthyl core independently may be unsubstituted or substituted with R_5 and R_6, respectively, any number of times up to the limitations imposed by stability and the rules of valence;

R_1 and R_2, and/or R_3 and R_4, taken together optionally represent a ring consisting of a total of 5-7 atoms in the backbone of said ring; of which atoms zero, one or two atoms are heteroatoms; and said ring is substituted or unsubstituted;

R_{80} represents an unsubstituted or substituted aryl, a cycloalkyl, a cycloalkenyl, a heterocycle, or a polycycle;

m is an integer in the range 0 to 8 inclusive;

the ligand, when chiral, is a mixture of enantiomers or a single enantiomer; and

the base is selected from the set consisting of carbonates, phosphates, fluorides, alkoxides, amides, carbanions, and silyl anions.

54. **(amended)** The method of claim 53, wherein

[the ligand is 2;]

the transition metal is palladium; and

the base is an alkoxide, amide, phosphate, or carbonate.

55. **(amended)** The method of claim 53 or 54, wherein:

[the ligand is 2, wherein] X is NR_2 [hydrogen], and Y represents $P(alkyl)_2$ or $P(cycloalkyl)_2$; and

X represents Cl or Br.

56. **(amended)** The method of claim 53, wherein

X represents Cl or Br;

the transition metal is palladium; and

[the ligand is 4; and]

the base is an alkoxide, amide, carbonate, phosphate, or fluoride.

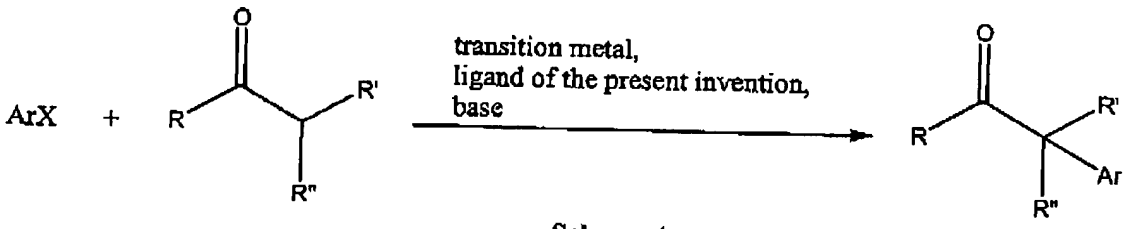
57. **(amended)** The method of claim 53, wherein

[the ligand is 4, wherein] R_1 and R_2 are absent; $[P(R)_2]$ Y represents PCy_2, and $[N(R)_2]$ X represents NMe_2; and

X represents Cl.

58. **(amended)** The method of claim 53, wherein [(alkenyl)X serves as a surrogate for ArX] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8 represent hydrogen; Y represents $P(t\text{-}Bu)_2$ or PCy_2; X represents NMe_2; the transition metal is palladium; and the base is cesium fluoride or potassium fluoride.

65. **(amended)** The method depicted in Scheme 4:



Scheme 4

wherein

Ar is selected from the [set] group consisting of optionally substituted monocyclic and polycyclic aromatic and heteroaromatic moieties;

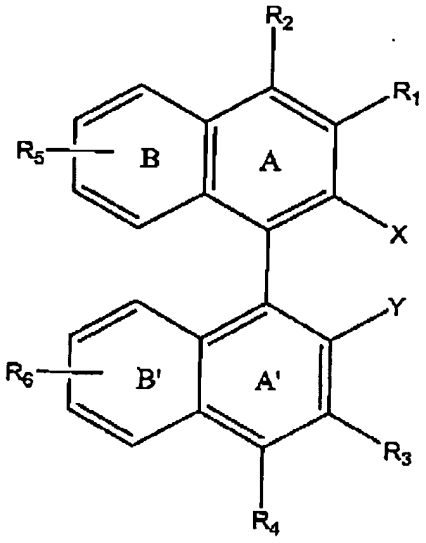
R, R', and R" are selected, independently for each occurrence, from the [set] group consisting of H, alkyl, heteroalkyl, aralkyl, aryl, heteroaryl;

X is selected from the [set] group consisting of Cl, Br, I, $-OS(O)_2$alkyl, and $-OS(O)_2$aryl;

Ar and one of R, R', and R" may be covalently linked [such that the reaction is intramolecular];

the transition metal is selected from the [set] group consisting of the Group VIIIA metals;

the ligand is selected from the [set] group consisting of a compound represented by 3: [1-7 inclusive; and]



3

wherein

X and Y represent, independently for each occurrence, NR_2, PR_2, AsR_2, OR, or SR;

R, R_1, R_2, R_3, and R_4, for each occurrence, independently represent hydrogen, halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine, carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{8a}$;

R_5 and R_6, for each occurrence, independently represent halogen, alkyl, alkenyl, alkynyl, hydroxyl, alkoxyl, silyloxy, amino, nitro, sulfhydryl, alkylthio, imine, amide, phosphoryl, phosphonate, phosphine, carbonyl, carboxyl, carboxamide, anhydride, silyl, thioalkyl, alkylsulfonyl, arylsulfonyl, selenoalkyl, ketone, aldehyde, ester, heteroalkyl, nitrile, guanidine, amidine, acetal, ketal, amine oxide, aryl, heteroaryl, azide, aziridine,

carbamate, epoxide, hydroxamic acid, imide, oxime, sulfonamide, thioamide, thiocarbamate, urea, thiourea, or $-(CH_2)_m-R_{80}$;

the B and B' rings of the binaphthyl core independently may be unsubstituted or substituted with R_5 and R_6, respectively, any number of times up to the limitations imposed by stability and the rules of valence;

R_1 and R_2, and/or R_3 and R_4, taken together optionally represent a ring consisting of a total of 5-7 atoms in the backbone of said ring; of which atoms zero, one or two atoms are heteroatoms; and said ring is substituted or unsubstituted;

R_{80} represents an unsubstituted or substituted aryl, a cycloalkyl, a cycloalkenyl, a heterocycle, or a polycycle;

m is an integer in the range 0 to 8 inclusive;

the ligand, when chiral, is a mixture of enantiomers or a single enantiomer; and

the base is selected from the set consisting of carbonates, phosphates, fluorides, alkoxides, amides, carbanions, and silyl anions.

66. **(amended)** The method of claim 65, wherein

[the ligand is 2;]

the transition metal is palladium; and

the base is an alkoxide, amide, phosphate, or carbonate.

67. **(amended)** The method of claim 65 or 66, wherein

[the ligand is **2**, wherein] X is NR_2 [hydrogen], and Y represents $P(alkyl)_2$ or $P(cycloalkyl)_2$; and

X represents Cl or Br.

68. **(amended)** The method of claim 65, wherein

X represents Cl or Br;

the transition metal is palladium; and

[the ligand is **4**; and]

the base is an alkoxide, or amide.

69. **(amended)** The method of claim 65, wherein

[the ligand is 4, wherein] R_1 and R_2 are absent; [$P(R)_2$] Y represents PCy_2, and [$N(R)_2$] X represents NMe_2.

71. **(amended)** The method of claim 65, wherein [(alkenyl)X serves as a surrogate for ArX] R_1, R_2, R_3, R_4, R_5, R_6, R_7, and R_8 represent hydrogen; Y represents $P(t\text{-}Bu)_2$ or PCy_2; X represents NMe_2; the transition metal is palladium; and the base is cesium fluoride or potassium fluoride.

79. **(amended)** The method of claim 21, 41, 53, or 65, wherein [the transition metal and ligand are selected to provide the product when] X is chloride.